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Announcement of the
Summer School of Biology
1923

July 7-August 17

Ithaca, New York
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THE CALENDAR

Summer Session of 1923

- July 7.. .Saturday, 8 A. M.—5 P. M..Registration, Room A, Goldwin Smith Hall.
- July 9.. .Monday.Instruction begins at time and place announced under each course. Registration continued at the Registrar's Office, Morrill Hall.
- July 9.. .Monday, 8 P. M.Opening Convocation, Bailey Hall. Address by Dr. Frank Pierrepont Graves, Commissioner of Education and President of the University of the State of New York.
- July 10.. .Tuesday evening and following Tuesdays. . . .Organ Recital, Sage Chapel.
- July 11.. .Wednesday evening and following Wednesdays. . . .Departmental Lectures and Conferences.
- July 12.. .Thursday evening and following Thursdays. . . .Piano Recital, Mr. E. R. Kroeger.
- July 13.. .Friday, until 4 P. M.. . . .Last day for payment of fees at the Treasurer's Office, 1 Morrill Hall.
- July 15.. .Sunday, 11 A. M. and following Sundays.Public Worship and Preaching in Sage Chapel.
- July 15. . . .Sunday evening and following Sundays.Organ Recital, Bailey Hall.
- July 16.. .Monday evening and following Mondays. . . .Lecture Course, Barnes Hall.
- July 20.. .Friday evening.Concert. Mabel Garrison, Soprano, Bailey Hall.
- August 3.. .Friday evening.Concert. Felix Salmond, Violoncellist, and Richard Crooks, Tenor, Bailey Hall.
- August 17.FridaySummer Session ends.

The *Weekly Calendar* of the University carries announcements of all public exercises held in connection with the Summer Session.

SUMMER SCHOOL OF BIOLOGY

Under the auspices of the Summer Session of Cornell University and of the Summer School of Agriculture of the New York State College of Agriculture.

STAFF OF INSTRUCTION

HOWARD BERNHARDT ADELMANN, A.M., Instructor in Animal Histology and Embryology.

JAMES CHESTER BRADLEY, Ph.D., Professor of Entomology.

FRANK DICKSON, A.B., Instructor in Plant Pathology.

OTIS FREEMAN CURTIS, Ph.D., Professor of Botany.

ARTHUR JOHNSON EAMES, Ph.D., Professor of Botany.

HARRY MORTON FITZPATRICK, Ph.D., Professor of Plant Pathology.

ALLAN CAMERON FRASER, Ph.D., Assistant Professor of Plant Breeding.

WILLIAM ARTHUR HAGAN, D.V.M., Professor of Pathology and Bacteriology.

RUFUS RICHARD HUMPHREY, A.M., Instructor in Animal Histology and Embryology.

OSKAR AUGUSTUS JOHANNSEN, Ph.D., Professor of Entomology.

BENJAMIN FREEMAN KINGSBURY, Ph.D., M.D., Professor of Animal Histology and Embryology.

ROBERT MATHESON, Ph.D., Assistant Professor of Entomology.

WALTER CONRAD MUENSCHER, Ph.D., Instructor in Botany.

HUGH DANIEL REED, Ph.D., Professor of Zoology.

BERNARD SMIT, B.S., Assistant in Entomology.

FRANK BURKETT WANN, Ph.D., Instructor in Botany.

HERBERT HICE WHETZEL, A.B., Professor of Plant Pathology.

KARL MCKAY WIEGAND, Ph.D., Professor of Botany.

ALBERT HAZEN WRIGHT, Ph.D., Assistant Professor of Zoology.

GENERAL PLANS AND AIMS

The Summer School of Biology was organized to provide instruction of the highest grade in zoology, botany, and allied subjects. All the regular facilities of the University are at the disposal of the student, and as far as possible the staff has been restricted to members of regular professorial rank in the University. The courses offered are for the most part those given during the regular academic year condensed into a period of six weeks, but not abridged. The work is particularly planned to meet the needs of teachers and graduate students who wish to know, in addition to the subject matter, something of the methods and sources in teaching; but undergraduates also, if sufficiently prepared, will find the courses adapted to their needs. Intensive rather than extensive work is necessarily expected of each student, as the courses are comprehensive.

The intensive interest in Biology at Cornell University over a period of years has resulted in a wealth of laboratory material, very extensive and in some cases unique collections of both plants and animals, and a very complete working library all of which are available to students prepared to make use of them. Ithaca is

located in the Finger Lakes region of Central New York, noted not only for its picturesque beauty, but for its richness in biological material of both plants and animals. In this respect the advantages of the University are perhaps not excelled by any other institution in the country. The collecting grounds are for the most part adjacent to the campus, and can be very readily reached. Within easy reach of the laboratories are freshwater marshes and lakes, salt springs, marl springs, marl bogs, peat bogs, extensive ravines with numerous waterfalls, and upland woods or fields overlying either calcareous or noncalcareous sandy or heavy soils. The country shows a considerable variation in elevation, thus giving samples of several life zones. It is therefore possible to use as illustrative material those inland organisms which may be obtained most readily by teachers throughout the country for use in their own classes.

ADMISSION, ATTENDANCE, REGISTRATION

Each person must satisfy the instructor in charge of any course that he is qualified to pursue the work. Persons wishing to have work done during this summer session counted toward a degree may do so by complying with the regulations stated in subsequent paragraphs.

All students must register at the office of the Registrar. The regular day of registration is July 7, but students may register later. Correspondence in advance with teachers with whom work is to be taken is frequently of advantage both to the student and to the teacher. Class exercises begin on July 9.

Students who wish credit for graduate work must register not only with the Registrar, but also with the Dean of the Graduate School, Room 22, Morrill Hall.

TUITION FEE

The single tuition fee of \$40 is charged whether one or more courses are taken. This must be paid at the office of the Treasurer, Room 1, Morrill Hall, within five days after registration day. In case of withdrawal within five days from registration day, for reasons satisfactory to the Comptroller and the Registrar, the tuition paid may be refunded and the charge cancelled. In case of withdrawal within two weeks after registration day one-half of the tuition may be refunded. In case of registration after the first three weeks of the session students must pay two-thirds of the full tuition fee. No student is admitted without the payment of the fee.

LABORATORY FEES

A fee is charged, as stated under each course, to cover the use of materials and laboratory equipment. In some courses a deposit is required to cover breakage and apparatus checked out to students during the period of the session.

UNDERGRADUATE ACADEMIC CREDIT

On the completion of any course offered in the Summer School of Biology the student may receive credit toward a degree for the number of hours indicated under each course. Requirements for the baccalaureate degree in each college may be learned on application.

GRADUATE WORK

Graduate students, if not candidates for advanced degrees, may take any courses desired with no further formalities than those indicated above.

Graduate students who wish to pursue studies leading toward an advanced degree should select courses after conference with the members of their special committees. Advanced graduate students engaged in special study and research are urged to be in residence in Ithaca for a longer period during the summer than six weeks if suitable arrangements for supervision can be made with their committees. Correspondence regarding such work should be carried on in advance. If such arrangements can be made no extra fees will be charged.

Graduate work at Cornell is not expressed in terms of courses and hours. A graduate of any college whose requirements for a first degree are substantially equivalent to those for the baccalaureate degree at Cornell may be admitted to resident study in the Graduate School, and may enter upon his work, provided he has had sufficient previous preparation in the subjects which he wishes to pursue. Before beginning his work he must register, as explained above, both with the Registrar and in the office of the Graduate School, and he must also select a special committee who will give supervision and advice. The degrees of A.M., M.S., and Ph.D. are offered. If a candidate wishes to matriculate for the Master's degree he must select an acceptable major subject and one related minor subject and obtain the signature of the professors representing those fields of study. The professors with whom he thus works constitute his special committee. If he is to be a candidate for the degree of Doctor of Philosophy he must choose at least one professor under whom he is to pursue his major work and at least two other professors each to represent one minor subject, and these men constitute his special committee. While the candidate is expected to assume the initiative and responsibility for his studies, he is expected to follow the general advice of this committee, who will examine him on the completion of his work and recommend him for the degree.

As stated above, the requirements for the degree do not depend primarily on the completion of any prescribed number of courses. They are based rather upon actual achievement in scholarship and research in the field chosen. The writing of a thesis and passing of a special examination are required. Graduate work to be considered acceptable for a degree must be of an advanced character in some field or department of knowledge. The minimum period of residence for the Master's degree is one academic year or its equivalent, and for the Doctor's degree three years. Residence requirements for the degree of Master of Arts or Master of Science may be fulfilled in whole or in part by attendance at the Summer School. For this purpose two summer sessions will be regarded as the equivalent of one term, and four summer sessions as the equivalent of one year. For the purpose of residence credit no period of less than six weeks will be counted. Candidates for the degree who are in residence during the summer sessions only are also required to continue their studies during the year under the direction of the chairman of the special committee in charge of their work. Residence credit for the degree of Doctor of Philosophy during the summer is contingent upon the length of time and the nature of the work to be done, and must be arranged for in advance.

Any person wishing to become a candidate for an advanced degree and to study during the summer is advised to write to the professor whose work he expects to

take, and also to the Dean of the Graduate School asking for a copy of the *Announcement of the Graduate School* and a blank form of application for admission. It is much better to make these arrangements before coming to Ithaca, thus avoiding delay and interruption of study after the work has begun. In this way, moreover, it may be possible to secure the advice and guidance of professors in fields of study of which no specific mention is made in the announcements.

An invitation is issued to scholars who are beyond the stage of regular graduate study to make use of the resources of the University in the field of Biology for carrying on research.

CERTIFICATES FOR WORK DONE

Students of the Summer Session who are not matriculated in the University may receive certificates of attendance and of work satisfactorily performed. Application for them must be made before August 16, and the applicant must leave at the office of the Registrar a large-sized envelope stamped and directed to his home address. The certificate will then be forwarded by mail. The regulations of each department for the granting of a certificate must be met.

COST OF LIVING

The cost of board and furnished room in Ithaca during the Summer Session runs from \$10 a week upwards. In some cases the cost has been reduced to \$9, but it is not safe to count upon less than this sum.

The price of a single furnished room may be as low as \$3 a week. The prices advance with the size and location of the rooms.

Rooms are engaged with the understanding that they will be occupied for the entire session, unless otherwise agreed upon by both parties. Table board is usually engaged by the week, or, if so stated, by the day.

A list of desirable rooms in private houses may be had on application after June 1. Students are cautioned against unauthorized rooming-house agents.

The price of table board runs from \$7 to \$10 in boarding houses. In cafeterias and restaurants, the average cost of meals amounts to about the same sum. Three cafeterias under the management of the University are easily accessible on the campus.

RESIDENTIAL HALLS, ROOMS, BOARD

1. **For Women.** The University has three residential halls for women in which board and rooms may be obtained during the Summer Session by registered students only.

Rooms in these buildings will be reserved in the order of application. Each application for a room must be accompanied by a deposit of \$5; otherwise the application will not be entered. If the room assigned is occupied by the applicant the amount of this deposit is held until the end of the session to cover the return of keys, damage to building or furniture other than ordinary wear and tear, and to insure the completion of the lease. The deposit is refunded if the applicant gives formal notice to the manager on or before June 15 that she wishes to withdraw her application.

In Sage College, which accommodates 175, the charge for room, table board, and a specified amount of laundry, will be, for the session, from \$72 to \$84 according to the size and location of the room.

In Prudence Risley Hall, which accommodates 184, the charge will be from \$78 to \$84 according to the room occupied.

In both buildings this charge includes lodging Friday night, July 6 (not earlier), breakfast Saturday, July 7, and all meals to and including breakfast Saturday, August 18.

Members of the Summer Session who do not room in Sage College or Prudence Risley Hall may obtain table board at either. The charge is \$9 a week.

In Cascadilla Hall a furnished room may be had for the six weeks of the Summer Session at a cost of \$23 to \$29, this charge including a specified amount of laundry. This building is furnished like the others but has shower baths and not tubs. In this building the University maintains a dining-room and a cafeteria restaurant where meals may be had at reasonable rates.

Each of the residential halls is in charge of a warden, who is glad to know the students, to advise them in case of illness or other emergency, and to give them what information they may wish about the University, the town, and the community. It is understood that persons living in the Halls will conform to the house regulations made for the convenience and comfort of all.

Undergraduate women students of Cornell and other colleges and other women students under twenty-one years of age are expected to live in the Residential Halls or in one of the Approved Houses occupied exclusively by women and under the direct supervision of the Dean of Women.

A list of Approved Houses may be had on request after June 1, and also a supplementary list of houses available for older women who prefer to live outside of the Halls and Approved Houses.

It is not safe to engage rooms in places not recommended by the University. For room plans and all information relative to these Halls, and to other Approved Houses for Women, apply to Mr. Thomas Tree, Manager of Residential Halls, Sage College, Ithaca, New York.

2. **For Men.** Rooms in Baker Court will be available for men students. For room plans and all information concerning Baker Court, apply to the University Treasurer, Ithaca, N. Y.

Checks for reservation of room, or in payment of board bills, should be drawn to the order of Cornell University.

Self-support. Students, both men and women, who may wish to earn a part of their expenses during the Summer Session, are invited to correspond in advance with Mr. Thomas Tree, Sage College, Ithaca, N. Y.

THE LIBRARIES

The University Library is open on week days from 8 a. m. to 10:30 p. m. In this building are the main library, containing about five hundred thousand volumes and most of the seminary and special libraries. The main reading room affords accommodations for more than two hundred readers, and contains a selected library of over 8,000 volumes of reference works. Below stairs is the periodical room in which are kept the current numbers of about five hundred journals in

various fields of knowledge. These rooms are open to all students. Students properly qualified are allowed the use of the seminary rooms and the books in them. The main collection is primarily a library of reference for use in the building. Students are, however, to a limited extent, allowed to take out books for home use. Persons wishing this privilege must make a deposit of \$5, which will be refunded upon the return of all books taken out.

The Library of the College of Agriculture, in the basement of Stone Hall, is open on week days from 9 a. m. to 5 p. m., except Saturday, when it is closed at 1 p. m. In it will be found a large collection of bulletins and reports of experiment stations, reference books on agriculture and country life, agricultural periodicals, and the like. The entomological library, in the Department of Entomology on the fourth floor of the main building, is one of the most complete of its kind in the United States. Nearly all the departments in which instruction is given have well-selected departmental libraries.

SAGE CHAPEL

Religious services are conducted in Sage Chapel throughout the academic year by eminent clergymen selected from the various religious denominations. There will be services in the Chapel on five Sundays during the Summer Session, July 15 to August 12, inclusive.

PHYSICAL EXAMINATIONS AND MEDICAL ADVICE

The medical advisers observe regular office hours, daily 10-12 a. m., at their respective offices in the gymnasium for men and in Sage College for women.

In cases of illness or indisposition which involve absence from classes even for one day, students are expected to report immediately either in person, by telephone, or by messenger to the medical advisers' office. For the convenience of the medical advisers such illness should be reported early in the day. Students who are indisposed but still able to attend classes should consult the medical advisers immediately in order that advice may be given and diagnosis of incipient diseases may be made promptly. Any student failing to report as soon as possible to the medical advisers any contagious or infectious disease will be regarded as guilty of a serious breach of discipline.

No charge is made for the services of the medical advisers.

A student may at any time be requested to withdraw from the University if, in the opinion of the University authorities, the condition of his health is such as to make it unwise for him to remain.

THE CORNELL INFIRMARY

The Cornell Infirmary is the former mansion of the late Henry Williams Sage, for many years chairman of the Board of Trustees of the University. At his death in 1897, his sons, Dean and William Henry Sage, endowed it and gave it to the University for a students' Infirmary as a memorial to their father. In 1912 a modern fireproof addition was erected with a capacity of sixty-two beds.

The Infirmary, which is in charge of an experienced superintendent, is thoroughly equipped in every way, and is open throughout the University year.

It provides suitable rooms, food, and nursing for sick students. It has no medical staff; students employ their own physicians among practitioners in Ithaca or elsewhere.

Students in the Summer School have all the privileges of admission to the Infirmary. They pay no fee in advance, but are liable to regular charges for services rendered.

LECTURES, MUSICAL RECITALS, EXCURSIONS

In addition to the regular classroom work there will be public lectures on Monday evenings.

There are also lectures of general interest each week in connection with the various departments. Notice of these will be given in the University Calendar.

Organ recitals will be given on Tuesday evenings in Sage Chapel and on Sunday evenings in Bailey Hall.

A piano lecture-recital will be given each week by Mr. Ernest R. Kroeger.

Two University concerts by distinguished artists will be given during the Summer Session. Tickets for these concerts may be had at reduced rates by all students.

Wednesday evenings are devoted to the departmental conferences, which are open to all interested. Notice of these will be given from week to week.

In connection with the work of the several departments excursions are made to many points of interest. Some of these are open to all members of the Summer Session. Notable for their attractiveness are the excursions to Watkins Glen and to Niagara Falls.

RAILROAD ROUTES

Ithaca is reached by three railroads: the Lehigh Valley; the Delaware, Lackawanna, and Western; and the Central New York Southern. The Ithaca branch of the Lackawanna leaves the main line at Owego. Through trains run from New York and Buffalo on the Lehigh, and through sleeping cars run daily from New York on both roads. From Philadelphia, and from Baltimore, Washington, and the South via the Baltimore & Ohio, the Philadelphia & Reading connects with the Lehigh at Bethlehem. On the Lehigh, through trains for Ithaca connect with the New York Central at Auburn, and with the Pennsylvania (Northern Central) and the Erie at Elmira. Trains on the Central New York Southern also connect with the New York Central at Auburn.

Correspondence with reference to the School of Biology should be addressed to Professor KARL M. WIEGAND, Stone Hall, Cornell University, Ithaca, N. Y.

COURSES DEALING PRIMARILY WITH PLANTS

(A limited amount of change in the hours scheduled may be made by the staff at the beginning of the session to avoid conflicts. In the case of morning laboratories the student may obtain permission, at the option of the instructor, to be absent for a period to attend a lecture in some other course. The time so lost is to be made up later.)

S 1. General Botany. Credit six hours. Equivalent to Botany 1. Lectures, M T W Th F, 8. Laboratory, M T W Th F, 2-4:30. Additional lectures and field studies at hours to be arranged. *Stone.* Professor EAMES and Dr. WANN.

This course is designed to furnish a general knowledge of the fundamental facts and principles of plant life. A careful study is made of form, structure, and reproduction of representatives from the principal groups, with a view to orient the student in the plant kingdom, and to acquaint him with the principal evolutionary tendencies exhibited. Considerable attention is given to life processes, particularly in the higher plants, and to information necessary in the prosecution of more advanced or practical work connected with plants and animals. Laboratory fee, \$5.00.

S 2. Plant Physiology. Credit four hours. Prerequisite, Course 1, chemistry, and permission to register. Lectures, M T W Th F, 12. Laboratory T W Th F, 9-12. *Stone.* Professor O. F. CURTIS.

This course is designed to acquaint the student with the general principles of plant growth. Topics such as water-relations, photo-synthesis, translocation, digestion, respiration, mineral nutrition, and reproduction are studied in some detail and particular emphasis is placed both in laboratory and classroom on discussions of the principles and their applications to growing plants. Laboratory fee, \$4.00; deposit, \$2.00.

S 3. Taxonomy of Vascular Plants. Credit four hours. Equivalent to Botany 6. Prerequisite, Course 1 or its equivalent. Lectures, M T W Th F, 11. Laboratory, M W, or T Th, 2-5. Sat., 8-1, 2-5. Several all-day field trips will be arranged. *Stone.* Professor WIEGAND.

A study of the kinds of seed plants and ferns; their classification into genera, families, and orders; and field work on the local flora. Emphasis will be placed on wild plants, but the more common cultivated plants will receive some attention. The course is planned to follow Course 1 and to furnish an introduction to the knowledge of field botany and to the classification of the higher plants in preparation for special work in various departments and as an aid in teaching. Instruction will be given in herbarium methods. Laboratory fee, \$4.00; deposit, \$3.00.

S 4. Comparative Morphology of Fungi. Credit four hours. Equivalent to Mycology 14. Prerequisite, Course 1 or its equivalent and permission to register. Lectures, M T W Th F, 9. *Bailey, West Basement.* Laboratory, fifteen actual hours a week, by arrangement. *Bailey, East Basement.* Professor FITZPATRICK.

An elementary synoptical course designed to acquaint the student with the general field of mycology. Emphasis is placed on morphology and phylogeny, rather than on taxonomy, but abundant opportunity is given for field work. Laboratory fee, \$6.00; deposit, \$3.00.

S 10. General Plant Pathology. Credit three hours. Equivalent to Plant Pathology 1. Prerequisite, Course 1 or its equivalent and permission to register. Lectures, M W F, 7 a. m. Laboratory work; the completion of a minimum of fifteen exercises requiring not less than fifteen actual hours a week, with personal conference of half an hour on each. Conferences by arrangement. Laboratory at the student's convenience. Professor WHETZEL and Mr. DICKSON.

A fundamental course treating of the nature, cause, and control of plant diseases illustrated by studies of the commoner diseases of cultivated crops. Admission limited to twenty students. Laboratory fee, \$4.50; deposit, \$3.00.

S 19. Special Problems with Plants. Credit two or more hours. Hours to be arranged.

Students who are sufficiently prepared may arrange to engage in the study of some problem or special topic. Such work may lie in the fields of general or taxonomic botany, mycology, plant physiology, or plant pathology. A certain member of the staff must supervise the work.

COURSES DEALING PRIMARILY WITH ANIMALS

S 20. General Zoology. Credit six hours. Equivalent to Zoology 1. Lectures, M T W Th F, 9. Laboratory, M T W Th F, 2-5. Field studies at hours to be arranged. *McGraw*. Professor REED.

A comprehensive view of the subject, including the fundamentals of animal biology; the principles of structure, function, origin, and perfection of animal life; and a consideration of generalizations in zoological theory which seem to be the best founded. The study of animals in their relation as living things will be emphasized. Animal types and their classification are employed only as a service base from which study may proceed. Laboratory fee, \$5.00.

S 21. Systematic Vertebrate Zoology and Ecology. Credit four hours. Lectures, T W Th F, 9. *McGraw* 7. Laboratory and field work, T Th, 10-1, 2-5, W F, 10-12. Some all-day trips are required. Occasionally a field trip 5:30-8 a. m. or 5-8 p. m. may be substituted for the regular periods. Assistant Professor WRIGHT.

Lectures on fishes, amphibians, reptiles, birds, and mammals: their habits, life-histories, coloration, respiration, locomotion, reproduction, and adaptations; together with their classification, nomenclature, characters, and relationships. Laboratory study of the parts employed in the classification of these groups, with training in the identification of two hundred and forty North American species. Field work is partially to give practice in field observation and in ready identification of local vertebrates in their natural environment, and partially to introduce some ecological methods. Text book, Jordan's *Manual of Vertebrates of North-eastern United States*. Laboratory fee, \$3.00.

S 26. Histology. The tissues and their histogenesis. Credit four hours. Equivalent to Histology 1. No prerequisite, but previous work in biology (zoology and botany) or physiology is recommended. Lectures, M W F, 8; M W, 12. Quiz, F, 2. Laboratory, M W, 9-12; 2-5. *Stimson*. Professor KINGSBURY and Mr. HUMPHREY.

For students of biology or those preparing for medicine. The cell and cellular origin of the body and the structure and development of its component tissues. Each student will prepare or receive a series of typical microscopic preparations.

The courses in histology and embryology are given in the histological laboratories in Stimson Hall. The department is well equipped for instruction in both subjects, having a large and adequate supply of modern microscopical instruments and an extensive collection of demonstration material for both histology and embryology. Microscopes are furnished by the department. Consultation with the instructors previous to registration is advised. Laboratory fee, \$6.00.

S 27. Embryology of Vertebrates. Credit four hours. Equivalent to Embryology of Vertebrates 4. Prerequisite, a course in the histology of the tissues or a satisfactory equivalent in other biological work involving training in the use of the microscope. Lectures, T Th F, 9; T Th, 12. Quiz, F, 12. Laboratory, T Th F, 10-12; T Th, 2-5. *Stimson*. Professor KINGSBURY and Mr. ADELMANN.

For students of biology or those preparing for medicine. Preparation and study of embryological specimens from all the chief groups of vertebrates. Particular emphasis is placed on the embryology of the amphibian, chick, and pig. The student also acquires a knowledge of special methods useful in embryological work. Laboratory fee, \$6.00.

S 30. General Entomology. Credit three hours. Equivalent to Entomology 3. Prerequisite Biology 1 or Zoology 1 or its equivalent. Lectures, M T W Th F, 10. Practical exercises, T Th, 2-5; S, 8-11. *Roberts* 392. Assistant Professor MATHESON.

This course includes lectures and demonstrations on the characteristics of the orders and families of insects, with a study of their habits, life-histories, and relations to other animals and to plants. The laboratory work consists of the study of the structure, ecology, metamorphosis, and classification of insects. Field trips to study insects in their natural habitats are an important feature. Each student is required to collect and prepare a typical collection of insects. Opportunities are given for the rearing of insects in our Insectary, and special work is offered to suit the needs of individual students. Textbook: Comstock's *Manual for the Study of Insects*. Equipment: a good hand lens, several insect cases, insect pins, and labels. These can all be purchased at Ithaca. Laboratory fee, \$2.50.

S 31. Elementary Morphology of Insects. Credit three hours. Equivalent to Entomology 4. Twenty-two actual hours a week, by appointment. *Roberts* 391. Professor JOHANNSEN and Mr. SMIT.

This course deals with the external and internal anatomy of several representative insects as the locust, roach, cicada, honeybee, crane fly, etc. Laboratory fee, \$2.00.

S 32. Elementary Systematic Entomology. Credit two hours. Equivalent to Entomology 5. Prerequisite Course 4. Fifteen actual hours a week, by appointment. *Roberts* 391. Professor BRADLEY and Mr. SMIT.

The principles of wing venation and the classification of the orders and families. Laboratory fee, \$2.00.

Courses S 31 and S 32 are required of all students who plan to take advanced work in Entomology.

S 33a. Field Entomology. Credit three hours. Field work. Prerequisite, Course S 30, or S 31 and S 32, or equivalent. M W F, 8-5. *Roberts* 301. Professor BRADLEY.

The methods of collecting and preserving insects and a systematic exploration of various types of environment, with a view to making as exhaustive a survey as time permits of selected representative insect groups, the ethology of selected insects, and their breeding under control. Laboratory fee, \$3.00. Other expenses are the cost of transportation in connection with the excursions and the cost of equipment and supplies.

There will be an optional four-day excursion to the pine barren and coast regions of New Jersey, in order to study the totally different insect fauna of a life-zone and of ecological conditions not represented near Ithaca. The party will leave Ithaca the night of July 26, returning the morning of July 31. Expenses not to exceed \$40.00.

This course is designed to be taken in connection with S 33b.

S 33b. Advanced Systematic Entomology and Entomotaxy. Credit three hours. Open only to students who are taking Course S33a. T Th, 8-5; S, 8-1. *Roberts* 301. Professor BRADLEY.

Taxonomy of selected groups of insects, using as laboratory material the specimens collected in course S 33a; matters of museum technique. Laboratory fee, \$3.00.

S 34. Advanced Morphology of Insects. Credit two hours. Equivalent to the first term of Entomology 20. Prerequisite Course S 31, and either S 30 or S 32. Lectures, assigned reading, and reports. Daily except Sat., 9. *Roberts* 392. Professor JOHANNSEN.

This course deals with the anatomy, physiology, and microscopic structure of insects.

S 39. Special Problems with Animals. Credit two hours or more. Hours to be arranged.

Students who are sufficiently prepared may arrange to engage in the special study of some problem or special topic. Such work may lie in the fields of general zoology, ornithology, histology, embryology, general entomology, systematic entomology, economic entomology, or general biology. A certain member of the staff must supervise the work.

GENERAL COURSES DEALING WITH BOTH PLANTS AND ANIMALS

S 40. Genetics. Credit four hours. Prerequisite, elementary botany and plant physiology, or elementary zoology and animal physiology. Courses in cytology and in taxonomic botany and zoology will be found helpful. Lectures, M T W Th F, 8. Laboratory, M W F, 2-4:30. Conferences to be arranged. *Fernow*. Assistant Professor FRASER.

A general introductory course designed to acquaint the student with the fundamental principles of heredity and variation. Special attention is given to the Mendelian interpretations of the facts of inheritance. Among the topics to be discussed are: the physical basis of heredity; simple cases of Mendelian inheritance; factor interaction; the determination of sex; factor linkage; measurement

of variation; quantitative inheritance; pure lines; inbreeding and cross-breeding; cytoplasmic inheritance; and mutation, with suggestions as to the relation of genetical principles to eugenics. Laboratory studies of variation and of the laws of heredity as illustrated by hybrid material in plants and by breeding experiments with the fruit fly, *Drosophila*. Laboratory fee.

S 42. General Bacteriology. Credit three hours. Prerequisite some work in microscopy. Lectures, M T W, 11. Laboratory, T W Th F, 9-1. *Veterinary College*. Professor HAGAN.

A general introductory course in bacteriology covering the distribution, morphology, biology, and methods of study of micro-organism. In the latter half of the course the bacteria occurring in water and in milk and some of the more common pathogenic forms are studied in both laboratory and classroom. Laboratory fee, \$10.00.

METHODS

Arrangements can be made, contingent upon the time of the instructor, for additional instruction in biological technique. This may include instruction in methods of collecting and preparing laboratory and museum material, the technique of hybridization, etc.

RESEARCH

In addition to the various professors named as directly connected with the Summer School of Biology, other professors who may be in residence during the summer will supervise graduate students engaged in research: Professors REDDICK and SHARP in Botany; Professors BLODGETT, BURKHOLDER, and THOMAS in Plant Pathology; Professors NEEDHAM, HERRICK, and CLAASSEN in Entomology; and Professors EMERSON, LOVE, and MYERS in Plant Breeding and Genetics.

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Announcement of the College of Arts and Sciences.

Announcement of the College of Engineering.

Announcement of the College of Law.

Announcement of the College of Architecture.

Announcement of the New York State College of Agriculture.

Announcement of the Winter Courses in the College of Agriculture.

Announcement of the Summer Term in Agriculture.

Announcement of the New York State Veterinary College.

Announcement of the Department of Chemistry.

Announcement of the Graduate School.

Announcement of the Summer Session.

Announcement of the Summer Session of the College of Law.

Announcement of the Summer School of Biology.

Program of the Annual Farmers' Week.

Annual Report of the President.

Special departmental announcements, a list of prizes, etc.

Other periodicals are these:

The Register, published annually in September, and containing, not announcements of courses, but a comprehensive record of the University's organization and work during the last year. Price, 50 cents.

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